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EXAMINER	
WANG, JIN CHENG	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/210,055	Applicant(s) MILLER, JOHN DAVID
	Examiner Jin-Cheng Wang	Art Unit 2672

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 28 October 2005.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 20,22,24,26,28,32,34 and 37 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 20, 22, 24, 26, 28, 32, 34 and 37 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendments

Applicant's submission filed on 10/28/2005 has been entered. Claims 20, 22, 24, 26, 28, 32, 34, 37 have been amended. Claims 1-19, 21, 23, 25, 27, 29-31, 33, 35-36 have been canceled. Claims 20, 22, 24, 26, 28, 32, 34 and 37 are pending in the applications.

Response to Arguments

Applicant's arguments filed October 28, 2005 have been fully considered but are moot in view of the new ground(s) of rejection.

Although Obata does not explicitly disclose that the viewpoint vector to be exactly the same as the light source vector, it would have been obvious to change the viewpoint vector to be exactly the same as the light source as the viewpoint position moves to the light source position. Obata at least suggests the viewpoint vector to be exactly the same as the light source vector by stating that the viewpoint and the light source are determined to be on the same side of the translucent surface and Fig. 2 also discloses that the viewpoint vector and the light source vector are in the opposite side of the object surface. Therefore, Obata teaches that the viewpoint position is movable with respect to the object surface.

Moreover, an object having surfaces have been described through the cited reference and therefore the object as taught by the reference refers to the three-dimensional object rather than a two-dimensional object. The lines illustrated in Figs. 2, 8 and 10 as related to the translucent object wherein the light source and viewpoint vectors intersect with represent the planar surfaces of the object in which the transparency of the object surface is the subject matter. Fig. 6 also

shows an object with planar surfaces and thus the object as taught by the cited reference is three-dimensional rather than two-dimensional. The description as related to Fig. 2 should be applied to three-dimensional object having planar surfaces illustrated in Fig. 6 and the viewpoint vector and light source vector intersect with the planar surfaces of the translucent object as illustrated in Figs. 8 and 10.

It would have been obvious to move the viewpoint position exactly at the light source position so that the viewpoint is at the same location with the light source and therefore theta depends on the normal vector at the planar object surface and the viewpoint vector as the viewpoint vector is the same as the light source vector. Moreover, Obata has extra freedom of varying the viewpoint vector and the light source vector.

One of the ordinary skill in the art would have been motivated to move viewpoint position at the light source position to view the translucent surface of the object (Obata column 7, lines 33-65) <u>because</u> *the eye position changes with respect to the object surface which in turn changes the mode with respect to the object (Fig. 2).*

Applicant argues that "it is clear from a careful reading of Obata that the color mixing taught therein does not provide a transparency factor depending on the angle of incidence claimed by the Applicants, but rather a characteristic of the material forming the object to be displayed." However, <u>Obata teaches that the transparency factor both depends on the angle of incidence and a characteristic of the material forming the object</u>.

Applicant argues that Obata does not disclose a mode such as FRONT_ONLY and BACK_ONLY etc, however, Obata discloses a mode in column 7, lines 39-49, and col. 9, lines 5-17. "...in step (3), it is **judged whether or not** a viewpoint and a light source are **on the same**

side of a display surface of a translucent object to be displayed. The surface is hereinafter referred to as a translucent surface. The judgment is performed wherein, for example, an inner product of the viewpoint vector VE and the normal vector VN and an inner product of the light source vector VL and the normal vector VN are obtained; then it is judged whether or not the product of the inner products is positive." Therefore, Obata discloses to judge whether a mode is FRONT_ONLY, BACK_ONLY or BOTH_SIDES.

In view of the rejection to the claim 20 set forth in this Office Action, Obata at least suggests all the claim limitations set forth in the claim 20. Moreover, Shinohara discloses the claim limitation of assigning a transparency factor to alpha. Shinohara teaches determining a transparency at each pixel enclosed by the vertices by correcting the transparency at each of the vertices of the polygon based upon a Z component of the unit vectors of each of the vertices and the factor is related to the angle at which the direction in which the surface of the polygon is inclined and therefore it becomes possible to change the transparency depending upon the angle relative to the direction of the line-of-sight and the light source; see column 4, lines 1-50; and column 7, lines 36-62.

<u>*Although the end points of a planar surface or the vertices of the polygon are located at the border of the planar surface, they are still points of the planar surface and the viewpoint intersects at these points at the planar surface forming an angle at each end point of the planar surface exactly meets the claim limitation of "the vector creating an angle of incidence at the planar object surface.*</u>

Shinohara discloses that Nz being a vector normal to the face of an observer/viewer and Nz being the Z-component of the unit vector N and Nz is incident at the surface of the polygon,

and the angle of incidence being the angle between the vector N and Nz; see column 4, lines 1-20. Shihohara further discloses that Nz is a N-component of the unit vector and depends on the angle formed by the planar surface of the polygon and the direction of the line-of-sight; see column 9. P=1, Nz=cos(theta); and a_out = a_in * Nz; see column 7, lines 35-67 and column 8, lines 1-9 in which Nz changes from 0 to 1 and therefore the output transparency is changed from opaque a_out = 0 to clear a_out = a_in; see also column 1.

It would have been obvious to have incorporate Shinohara's assigning the transparency factor to alpha into Obata's method for *setting the coefficients associated with the intensity components* so that the display of an opaque object or a translucent object (two different opacity values associated with the same image object) is realized.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 22, 24, 26, 28, 32, 34 and 37 are rejected under 35 U.S.C. 102(e) as being anticipated by Shinohara U.S. Patent No. 5,880,735 (hereinafter Shinohara).

Re Claims 22, 24, 26, and 28:

Shinohara teaches a method, comprising:

Identifying a vector normal to a viewing surface (*the normal vector of each pixel is determined through the complementary method by using the normal vectors of individual vertices; column 1, lines 67 and column 2, lines 1-2; determining the normal vector of each pixel on the planar surface also identifying the normal vector to the object surface.* ***Identifying a vector Nz being a vector normal to the face of an observer/viewer*** *or a viewpoint vector and Nz being the Z-component of the unit vector N*) and incident at an object having an object surface (both *Nz and N is incident at the polygon having planar surfaces;* ***column 10, lines 22-25 Shinohara discloses the further the angle at which the direction of the line-of-sight intersects with the planar surface of the polygon, the lower the transparency becomes***), the vector creating an angle of incidence at the object surface (*the vector Nz creates an angle of incidence at the planar surfaces of the polygon or exactly at the vertices/end points of the planar surfaces of the polygon and angle of incidence being the angle between the normal vector N and the line-of-sight Nz; see column 4, lines 1-20*); and

Modulating the transparency of an image of the object as a function of the angle of incidence of the vector at the planar object surface (***column 10, lines 22-25 Shinohara discloses the further the angle at which the direction of the line-of-sight intersects with the planar surface of the polygon, the lower the transparency becomes and thereby disclosing that the transparency of the pixels at the object surface is a function of the angle of incidence of the vector at the planar object surface because the transparency associated with each pixel enclosed by the vertices of the polygon is a function of the angles of incidence of the viewpoint vectors at the end points of a planar surface on the 3D polygon.***

Although the end points of a planar surface or the vertices of the polygon are located at the border of the planar surface, they are still points of the planar surface and the viewpoint intersects at these points at the planar surface forming an angle at each end point of the planar surface exactly meets the claim limitation of "the vector creating an angle of incidence at the planar object surface.

In column 4, lines 14-16, Shinohara discloses determining ***a transparency at each pixel enclosed by the vertices*** *by correcting the transparency at each of the vertices of the polygon based upon a Z component of the unit vectors of each of the vertices and* ***the factor is related to the angle at which the direction in which the surface of the polygon is inclined; column 4, lines 14-16*** *and therefore it becomes possible to change the transparency depending upon the angle relative to the direction of the line-of-sight and the light source; column 4, lines 1-50; and column 7, lines 36-62*), wherein the function comprises a cosine function or a nonlinear function (*e.g.,* ***column 10, lines 22-25 Shinohara discloses the further the angle at which the direction of the line-of-sight intersects with the planar surface of the polygon, the lower the transparency becomes.*** *Shihohara further discloses the function comprising a consine function of the angle of incidence of the viewpoint vector at the end points of a planar surface on the 3D polygon. Note that Nz is a Z-component of the unit vector and depends on the angle formed by the planar surfaces of the polygon, the direction of the line-of-sight and the normal vector of each pixel on the planar surface which is determined by using the normal vectors of individual vertices; see column 9. P=1, Nz=cos(theta); and a_out = a_in * Nz; see column 7, lines 35-67 and column 8, lines 1-9 in which Nz changes from 0 to 1 and therefore the output transparency is changed from opaque a_out = 0 to clear a_out = a_in; see also column 1*).

Re Claims 32, 34, 37:

Shinohara teaches a computer comprising:

A processor (*see CPU 1, Fig. 1*);

A computer-readable medium comprising a storage device comprising a memory (*e.g., Fig. 1 and column 5, lines 33-46 wherein a computer program is disclosed and the computer program has to be stored in a computer-readable storage medium in order to be executed; see column 13, lines 33-35*); and

A computer program capable of being executed from the computer-readable medium by the processor (*e.g., the program is executed by the CPU 1; see column 5-7 and column 13, lines 33-35*) to modulate a transparency factor of an image of an object as a function of an angle of incidence of a vector at a planar surface of the object (***column 10, lines 22-25 Shinohara discloses the further the angle at which the direction of the line-of-sight intersects with the planar surface of the polygon, the lower the transparency becomes and thereby disclosing that the transparency of the pixels at the object surface is a function of the angle of incidence of the vector at the object surface because the transparency associated with each pixel enclosed by the vertices of the polygon is a function of the angle of incidence of the viewpoint vector at the end points of a planar surface on the 3D polygon.***

<u>*Although the end points of a planar surface or the vertices of the polygon are located at the border of the planar surface, they are still points of the planar surface and the viewpoint intersects at these points at the planar surface forming an angle at each end point of the planar*</u>

<u>surface exactly meets the claim limitation of "the vector creating an angle of incidence at the planar object surface.</u>

In column 4, lines 14-16, Shinohara discloses determining ***a transparency at each pixel enclosed by the vertices*** *by correcting the transparency at each of the vertices of the polygon based upon a Z component of the unit vectors of each of the vertices and* ***the factor is related to the angle at which the direction in which the surface of the polygon is inclined; column 4, lines 14-16*** *and therefore it becomes possible to change the transparency depending upon the angle relative to the direction of the line-of-sight and the light source; column 4, lines 1-50; and column 7, lines 36-62*), the vector being normal to a viewing surface (*Nz is a viewpoint vector being normal to the face of an observer/viewer and Nz being the Z-component of the unit vector N. Both N and Nz are incident at the planar surfaces of the polygon, and the angle of incidence being the angle between the normal vector N and the viewpoint vector Nz; see column 4, lines 1-20*), wherein the function comprises a cosine function or a nonlinear function (*e.g.,* ***column 10, lines 22-25 Shinohara discloses the further the angle at which the direction of the line-of-sight intersects with the planar surface of the polygon, the lower the transparency becomes.*** *Shihohara further discloses the function comprising a consine function of the angle of incidence of the viewpoint vector at the end points of a planar surface on the 3D polygon. Note that Nz is a Z-component of the unit vector and depends on the angle formed by the planar surfaces of the polygon, the direction of the line-of-sight and the normal vector of each pixel; see column 9. P=1, Nz=cos(theta); and a_out = a_in * Nz; see column 7, lines 35-67 and column 8, lines 1-9 in which Nz changes from 0 to 1 and therefore the output transparency is changed from opaque a_out = 0 to clear a_out = a_in; see also column 1*).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Obata U.S. Patent No. 5,222,203 (hereinafter Obata) in view of Shinohara U.S. Patent No. 5,880,735 (hereinafter Shinohara).

Claim 20:

Obata teaches selecting a mode, the mode is FRONT-ONLY, BOTH SIDES, or BACK-ONLY (*The mode is* ***in relation to*** *the viewpoint vector, the light source vector and the normal vector of the object surface. The directions of these vectors govern the mode for FRONT-ONLY, BOTH SIDES, or BACK-ONLY; column 7*),

determining a viewing angle (<u>Determining VE to be the same as VL</u>; *Obata discloses viewpoint vector in Fig. 2 wherein the eye position changes with respect to the object surface which in turn changes the mode with respect to the object. It would have been obvious to move the viewpoint position exactly at the light source position so that the viewpoint vector coincides with the light source vector and therefore theta depends on the normal vector at the object surface and the viewpoint vector as the viewpoint vector coincides with the light source vector. Moreover, Obata has extra freedom of selecting/determining both the viewpoint vector and the*

light source vector. The opposite light source vector –VL with respect to the reference x-axis of an arbitrary reference frame forms the viewing angle and the light source vector VL coincides with the viewpoint vector VE. For the sake of subsequent explanation, the angle is denoted by va_alpha),

determining an object angle defined by a planar object surface (*e.g., object having surfaces have been described through the cited reference and therefore the object as taught by the reference refers to the three-dimensional object rather than a two-dimensional object. The lines illustrated in Figs. 2, 8 and 10 as related to the translucent object wherein the light source and viewpoint vectors intersect with represent the planar surfaces of the object in which the transparency of the object surface is the subject matter. <u>Determining VN</u>; The normal vector of the planar object surface with respect to the reference x-axis of an arbitrary reference frame forms the object angle. For the sake of subsequent explanation, the angle is denoted by oa_beta. Moreover, Fig. 6 shows an object with planar surfaces and thus the object as taught by the cited reference is three-dimensional rather than two-dimensional. Thus, the description as related to Fig. 2 applied to three-dimensional object having planar surfaces illustrated in Fig. 6 and the viewpoint vector and light source vector intersect with the planar surfaces of the translucent object; See also Figs. 8 and 10*),

calculating a theta, equal the viewing angle minus the object angle plus pi (*theta is the angle between the normal vector VN and the viewpoint vector VE which is in relation to the previously identified viewing angle and object angle. By definition of theta, theta is equal to pi – oa_beta + va_alpha; column 7*),

assigning a function of theta to alpha, if the mode is FRONT-ONLY or BOTH-SIDES (*the alpha being the cosine function of theta; see column 6*),

Obata explicitly discloses in Figs. 2 and 8 the angle of incidence theta and the brightness value or the color value depends on a non-linear function of the angle theta (column 6-7). From Obata's disclosure, the theta angle depends on the light source vector VL and the normal vector VN. By definition, the angle theta is equal to pi – {the angle between the normal vector VN of the object surface with respect to the x-axis of any reference frame} + {the angle of the opposite light source vector –VL (viewing from the light source) with respect to the x-axis of any reference frame}. The angle between the normal vector VN of the object surface with respect to the x-axis of any reference frame is the object angle of the claimed invention and the angle of the opposite light source vector –VL as viewing from the light source with respect to the x-axis of any reference frame forms the viewing angle of the claimed invention. The viewing angle and the object angle are inferred from the Obata's disclosure in Figs. 2 and 8 and column 6-7. The viewing angle and the object angle are directly related to the angle theta and the angle theta is critical for the determination of the color value or the transparency value and Obata.

Because the color value or transparency value can never be less than zero, alpha = cos (theta) should be always larger than or equal to zero, Obata implicitly teaches comparing alpha to zero; assigning zero to alpha, if the mode is FRONT_ONLY (<u>FRONT_ONLY mode is a mode formed by the position or location of the viewing source or the light source in relation to the object surface and therefore is decided by the relationship of the viewing source vector or the light source vector VL and the normal vector VN at the object surface</u>) and alpha is less than zero. Similarly, Obata implicitly teaches the transparency value to be larger than zero or equal

to zero and thereby Obata teaches assigning zero to alpha, if the mode is BACK_ONLY, and alpha less than zero. Because the color value or transparency value can never be less than zero, alpha = cos (theta) should be always larger than or equal to zero, Obata implicitly teaches assigning minus alpha to alpha, if the mode is BOTH-SIDES, and alpha is less than zero (column 6-7). These above steps are measures to prevent the alpha value being less than zero which one of the ordinary skill in the art should understand that alpha value for alpha blending should not be less than zero.

Therefore, Obata further discloses assigning a function of theta minus pi to alpha, if the mode is BACK ONLY (*Note that the mode changes when the light source and the viewpoint changes with respect to the object surface. Assigning a function of theta minus pi is equivalent to assigning a function of theta because cosine of theta minus pi reflects the brightness value after blending with the light source or the background image and is equal in absolute value to cosine of theta. BACK_ONLY corresponds to the viewpoint vector VE and the light vector being in opposite direction in which VN is rotated 180 degrees to obtain a normal vector and FRONT_ONLY corresponds to the viewpoint vector VE being in the same direction to the light source vector VL; column 6-7*);

comparing alpha to zero; assigning zero to alpha, if the mode is FRONT ONLY and alpha is less than zero (*Since the brightness value for an image object should be positive, the inner product between the normal vector of the object surface and the light source vector or cosine(pi – oa_beta +va_alpha) should be positive as well; column 6-7*); assigning zero to alpha, if the mode is BACK ONLY, and alpha less than zero (*the image object is displayed as an*

opaque object and since the brightness value for an image object should be positive, alpha value should be zero if it is less than zero);

assigning minus alpha to alpha, if the mode is BOTH-SIDES, and alpha is less than zero (*since the brightness value for an image object should be positive, alpha value should be zero if it is less than zero*; column 6-7).

In other words, Obata discloses a method for displaying a translucent object or an opaque object on a display screen comprising a step of displaying a translucent object by calculating the color intensity. The color intensity comprises an ambient light component and the diffused transmitted light component, which is in relation to an angle made between a normal vector of the object surface and a light source vector as being at normal to the light surface, the diffused transmitted light coefficient, and the intensity value corresponding to the light source. The angle of incidence of the incident light source being over the range of 0 to pi, so that the object develops its own color intensity on the basis of the diffused transmitted light coefficient Ktr, the intensity value corresponding to the incident light from a light source. The intensity or brightness of the image object is described by the color and/or transparency values. Obata teaches that, the actual display color of the image object is determined by **mixing the color of the image object and the color of the background image**, based upon the transmissivity of the translucent object (column 1). T*he transmissivity of the object is reflected as coefficient value in the image blending which is not related to the alpha value at all.* Obata teaches that, by appropriately setting the coefficients associated with the intensity components, the display of an opaque object or a translucent object can be controlled in such a way that an opaque object can be displayed by providing a zero value output from the diffused transmitted light component and a translucent

object can be displayed by providing zero value outputs from the diffused reflection light component and the specular reflection light component (column 7) wherein the background object is displayed as blurred to obtain a superior realistic display (column 6). In the case for translucent image object, the intensity of the image object is governed by the Itr component which is proportional to the transparency factor. The transparency of the image object is determined by a number of the input parameters such as the diffused transmitted light coefficient and reflection coefficient of ambient light depending upon the relationship among the light source, the viewpoint and the object surface. The transparency is zero for an image object to be displayed as an opaque object after setting the coefficients associated with the intensity components or parameters under certain conditions. The intensity of the diffused transmitted light greatly varies in accordance with the angle theta made between the normal vector of the object surface and the light source vector as being normal to the light source surface and how much the light comes through depends upon the cosine function of theta. The angle theta is usually 0 to pi, and theta = pi signifies the case that the object surface is at a position opposite to the light source, whereas theta = 0 means the case that the object surface is in a parallel and opposed relation to the light source so that it is in the most bright condition.

Moreover, Obata a mode is in relation to the viewpoint vector, the light source vector and the normal vector of the object surface. The directions of these vectors govern the mode for FRONT-ONLY, BOTH SIDES, or BACK-ONLY. The three vectors offer extra freedom in selecting a mode.

Although Obata does not explicitly disclose that the viewpoint vector to be exactly the same as the light source vector, it would have been obvious to locate the viewpoint to the same

position as the light source as the viewpoint position can be moved to the light source position. Obata at least suggests the viewpoint vector to be exactly the same as the light source vector by stating that the viewpoint and the light source are determined to be on the same side of the translucent surface and Fig. 2 also discloses that the viewpoint vector and the light source vector are in the opposite side of the object surface and therefore Obata teaches that the viewpoint position is movable with respect to the object surface.

It would have been obvious to move the viewpoint position exactly at the light source position so that the viewpoint vector coincides with the light source vector and therefore theta depends on the normal vector at the object surface and the viewpoint vector as the viewpoint vector coincides with the light source vector. Moreover, Obata has extra freedom of selecting/determining both the viewpoint vector and the light source vector.

One of the ordinary skill in the art would have been motivated to move viewpoint position at the light source position to view the translucent surface of the object (Obata column 7, lines 33-65) and *the eye position changes with respect to the object surface which in turn changes the mode with respect to the object (Fig. 2).*

However, Obata does not specifically teach the claim limitation of "assigning a transparency factor to alpha".

Shinohara discloses the claim limitation of assigning a transparency factor to alpha (*e.g., Shinohara teaches determining a transparency at each pixel enclosed by the vertices by correcting the transparency at each of the vertices of the polygon based upon a Z component of the unit vectors of each of the vertices and the factor is related to the angle at which the direction in which the surface of the polygon is inclined and therefore it becomes possible to*

*change the transparency depending upon the angle relative to the direction of the line-of-sight and the light source; column 4, lines 1-50; and column 7, lines 36-62. Shinohara discloses that Nz being a vector normal to the face of an observer/viewer and Nz being the Z-component of the unit vector N and Nz is incident at the surface of the polygon, and the angle of incidence being the angle between the vector N and Nz; see column 4, lines 1-20. Shinohara further discloses that Nz is a Z-component of the unit vector and depends on the angle formed by the planar surface of the polygon, the direction of the line-of-sight and the normal vector of each pixel (see column 1, lines 60-67 and column 2, lines 1-2); see column 9. P=1, Nz=cos(theta); and a_out = a_in * Nz; see column 7, lines 35-67 and column 8, lines 1-9 in which Nz changes from 0 to 1 and therefore the output transparency is changed from opaque a_out = 0 to clear a_out = a_in; see also column 1*).

It would have been obvious to have incorporated Shinohara's assigning a transparency factor to alpha to Obata's method because Obata suggests the claim limitation of "assigning a transparency factor to alpha". In column 1 and 6-7, Obata teaches that, <u>the actual display color of the image object is determined by **mixing the color of the image object and the color of the background image**</u>, <u>based upon the transmissivity of the translucent object which **dictates** the coefficients associated with the formula for calculating the brightness values</u> (column 1). Obata teaches that, by appropriately setting the coefficients associated with the intensity components, the display of an opaque object or a translucent object can be controlled in such a way that an opaque object can be displayed by providing a zero value output from <u>the diffused transmitted light</u> component and a translucent object can be displayed by providing zero value outputs from the diffused reflection light component and the specular reflection light component (column 7)

wherein the background object is displayed as blurred to obtain a superior realistic display (column 6). In the case for translucent image object, the intensity of the image object is governed by the Itr component which depends upon the transparency factor. The brightness value of the image object is determined by a number of the input parameters such as the diffused transmitted light coefficient and reflection coefficient of ambient light and the final brightness result of the image object depends upon the transparency value. The transparency is zero for an image object to be displayed as an opaque object after setting the coefficients associated with the intensity components or parameters, depending on the relationship among the light source, viewpoint and the object surface. The intensity of the diffused transmitted light greatly varies in accordance with the angle theta made between the normal vector of the object surface and the light source vector (viewpoint vector) as being normal to the light source surface (or viewpoint surface). The angle theta is usually 0 to pi, and theta = pi signifies the case that the object surface is at a position opposite to the light source, whereas theta = 0 means the case that the object surface is in a parallel and opposed relation to the light source so that it is in the most bright condition.

Finally, Obata teaches that, *by appropriately setting the coefficients associated with the intensity components*, the display of an opaque object or a translucent object (two different opacity values associated with the same image object) is realized. In the case for translucent image object, the intensity of the image object is governed by the Itr component and therefore **Itr is proportional to the transparency factor** for the blending of the effect of light source and the translucent image object. In this case, the brightness value is only determined by Itr because he transparency of the image object with respect to the light source is determined by a number of the input parameters such as the diffused transmitted light coefficient and reflection coefficient

of ambient light wherein only Itr component determines the color of the translucent image object (column 7, lines 12-25) so that *the outline of a light source* which is ***seen through*** (blended with opacity values) the translucent object is blurred to obtain a superior realistic display of the translucent object. The other term in the image blending as being proportional to (1-alpha) is set to zero due to the fact that the coefficients related to other components are set to zero. Note that the transparency is zero for an image object to be displayed as an opaque object after setting the coefficients associated with the intensity components or parameters.

In a non-limiting example, the transparency or opacity value of an image object pixel is proportional to cos (theta) which is the inner product between the normal vector of the object surface and the viewpoint vector being perpendicular to the viewing surface (say eye ball). If the viewpoint vector is in perpendicular to the object surface, cos (theta) = 1, resulting in the maximum opacity. It is also noted that the viewpoint vector and the light source vector of the prior art reference may be changed instead of fixed relative to each other and therefore this example applies only to a very specific situation in which the sheet face or the object surface being perpendicular to the viewpoint while the viewpoint vector and the light source vector are in opposite direction. If both the viewpoint and the light source are perpendicular to the sheet of paper, the transparency or opacity of the sheet of paper is maximum because cos(theta) = 1.

It would have been obvious to have incorporate Shinohara's assigning the transparency factor to alpha into Obata's method for *setting the coefficients associated with the intensity components* so that the display of an opaque object or a translucent object (two different opacity values associated with the same image object) is realized.

Therefore, according to the teaching of Obata, it would have been obvious to assign a transparency factor to alpha similar to what has been done in Shinohara. Doing so would enable the modification of the color of the object by **mixing the color of two image objects such as the image object and the color of background image**.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jin-Cheng Wang whose telephone number is (571) 272-7665. The examiner can normally be reached on 8:00 - 6:30 (Mon-Thu).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mike Razavi can be reached on (571) 272-7664. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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